

Earthwatch Research Report

New York City College of Technology
A Project of The Black Male Initiative

Summer 2008

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FOREWORD

The following report is a collaborative writing project by three New York City College of Technology student researchers to San Miguel Allende, Guanajuato, Mexico in the summer of 2008 -- Renee Clarke, Kashif Hoyte and Javier Joya. These students worked with Dr. Oscar Carranza Castaneda, principal investigator of the Mexican Megafauna project and researcher from Universidad Nacional Autonoma de Mexico. This project is part of Earthwatch International, a scientific organization, which in part offers opportunities to science students around the world to participate in real world inquiry.

In genre and style, this report is perhaps more journalistic than scientific in nature but captures the science and human learning experiences of these young scientists. Combining journaling, expository and descriptive writing; Renee, Kashif and Javier reflect on and review their research experience. The aim in this report was to experience and understand research fieldwork, develop research language, look at methodology and tools as well as observe socio-cultural diversity.

As in any authentic learning experience, these young researchers attempted to communicate how they are changing and growing as scientists and scholars. The writing process itself was laborious and difficult for them. Learning to summarize, clarify and communicate their experience proved a challenge. In addition, the challenge of drafting, revising and editing the report and working collaboratively added another dimension of difficulty.

A special thanks to The Black Male Initiative of The New York City College of Technology and the leadership of Dr. Reginald Blake and Dean Sonja Jackson. Thanks to Sonia Johnson and Latrice Goss who in many concrete ways made this significant learning experience possible.

Joni M. Schwartz
The Black Male Initiative Research Coordinator

RESEARCH OVERVIEW

This past summer New York City College of Technology sent a group of students on a research project that took place in Mexico. My name is Javier Joya, and I was one student along with Kashif Hoyt, and Renee Clarke who were honored with this privilege. The research, to be more precise, took place in San Miguel de Allende, Guanajuato State, Central Mexico. The main responsibilities for the trip were to help Dr. Carranza with his Paleontology research. Dr. Oscar Carranza Castaneda is a senior researcher of the Centro de Geociencias, Paleontological Studies. He received his Ph.D from the Universidad Autonoma de Mexico [1] (UNAM) in 1989, and he has been a member of the UNAM faculty since 1977. He is the author of many publications in Spanish and English language journals. He was co-principal investigator during the 1987 Mexican Megafauna research and has been lead principal of this project since 1990.

The San Miguel de Allende area in northeastern Guanajuato is culturally and naturally one of the most interesting areas of Mexico. San Miguel de Allende city offers a glimpse into Old Mexico and retains the atmosphere of a 16th Century colonial town. The climate in this part of Mexico tends to be warm and dry. The heat never gets oppressive due, in part, to the high elevation of the area (1,830 m/6,000 ft). The nights and early morning are pretty much cool. According to Dr. Carranza, rain is not typical in this area. Unfortunately at the time of the year we went, they were having the raining season. Therefore, there were times that we had to run and leave the research site due to the rain. The mud gets really sticky and slippery when it rains, and it is more difficult to drive with this environment. The research project took place in the field. In other words, most of the data that paleontology collects comes from the outdoors. The most important field sites for this project included: Rancho El Ocote GTO 2[4], Rinconada GTO43, Arroyo Tepalcates GTO52 and the Rancho Viejo areas GTO14.

This research summer project started on June 22, 2008 with the first team from Earthwatch International. EarthWatch is an institution that supports different ecological projects around the globe.

Their goal is to preserve the environment and those animals that are endangered. This particular project in Mexico ran from June 22 through July 19. There were a total of three teams with ten members. This was a total of thirty Earthwatch participants for this year; along with Dr. Carranzas wife and two interns that he had during the week that we were there. We were the second group. The length of stay was for seven days. However, some researchers decided to donate more money and stay for two weeks instead. Our responsibilities as researchers included: excavating for fossils, helping to prepare fossils collected during the day, helping the staff in organizing the field trip equipment, helping to prepare plaster jackets, and sometimes helping to prepare lunches when working at the fossil sites.

LEARNING SCIENCE

We learned that scientific research is not just about biology, chemistry, math, etc. It is also about history. This is one of the main reasons why Dr. Carranza is doing this research. By collecting fossils from ancient animals, we can study the reasons why they became extinct. We were exposed to difficult scientific terminologies. There were a few, somewhat strange, such as: *unconformity*, which is the small layer between other layers that gives us no information at all. As well as *Hemphillian* and *Blancan*, which refer to a given interval of time of a layer, by *Blancan* being the latest one and *Hemphillian* is the oldest. We, as a group, didn't use any fancy scientific or high technological devices. All we had an ice pick and a tiny whisk broom.

MEXICAN CULTURE

During our trip to Mexico, we learned a few things about Mexican culture. We kept in mind that different parts of Mexico, according to Dr. Carranza, have varying cultural aspects perhaps different than San Miquel Allende. We found the cuisine different from America; one special plate they have is mole and enchiladas. Also, their transportation is different from America; the way

they drive is like they have no laws to abide. Their lifestyle is different compared to the one in NYC. Most of the inhabitants in San Miguel de Allende, earn their money by cultivating their own products such as corn, wheat, etc. It is a much simpler life.

LEARNING ABOUT MY FELLOW RESEARCHERS

In addition to culture, I learned that I wouldn't like to become a Paleontologist, just for future reference. We also learned about each other. I learned a few things about Kashif and Renee. Kashif, loves jalapeos, and he also likes to eat mole. He is a person that likes to share his knowledge and his point of view on certain topics. Renee is a person who I definitely assume wouldn't like Paleontology to be her specialty in science for the future. I guess it is as good to know what you do not want to do as to what you want to do. Both of my fellow researchers are students who really apply themselves to what they do. They were always asking questions and listening to Dr. Carranza, during the period of time that we were in the field and a few mornings that we had field lectures.

RESEARCH BACKGROUND

North America and South America were not always connected as they are today. At one point in time, water covered the area where Panama is now. For many years, scientists believed that this Panamanian land bridge in Central America started developing 2.5 million years ago. This was based on the dating of fossils of North American animals that migrated to the faunas in the southern states of the USA. However, in these studies there were many omissions related to the discoveries of animals that migrated to South America. Subsequently, Dr. Carranza proved that there were several animals that migrated to South America much earlier than 3.1 to 2.5 million years ago, the date given to the Isthmus by other paleontologists. This was proven by the

discoveries of South American animal immigrants in Central Mexico, in rocks older than 3.9 million years ago.

One of the animals that played an important part in this discovery is the glyptodont, an armadillo the size of a Volkswagen. The Glyptodont is a South American immigrant, whose fossil in central Mexico is dated 2.5 million years ago. Based on findings, Dr. Carranza concluded that the Isthmus of Panama must have started one and a half million years earlier than they previously thought. Not everyone accepted Dr. Carranza's dating of the Isthmus of Panama and contested this conclusion. Many scientists tried to rationalize Dr. Carranza's results by proposing that the earlier animals could have swum across the ocean. However, Dr. Carranza disagrees with this hypothesis and argues that the animals don't have the adaptations for swimming long distances in the sea water and the currents in the oceans. Dr. Carranza also believes that there could have been more than one migration period.

Today, Dr. Carranza is working on strengthening his conclusion that the Isthmus of Panama started 2.5 million years earlier than it was previously dated. His current research involves excavating in areas where fossils have not been found so that he can map out the migration route and timeline of the Great American Biotic Interchange. This was what we worked on.

WHAT WE LEARNED ABOUT PALEONTOLOGY

Definition

Paleontology, the study of ancient life through fossils, is a mixture of geology, biology and ecology. In paleontology, the dating of rocks and the examination of fossils are used to determine the effects of climate changes on evolution, the response of ecosystems to these changes, and how this impacts today's biodiversity.

Sedimentary Basin

The stratigraphy of the sedimentary basins is made up of several different layers. In the canyons and arroyos in the transmexican volcanic belt; there are two distinct mammalian ages. There is the Hemphillian layer which represents 9 to 4.8 million years ago. On top of that, there is the Blancan, which represents 4.7 to 1.8 million years ago. Between the Blancan and Hemphillian layers there is a thin layer of unconformity. Unconformity is a layer that has no fossil information and therefore, it is missing time. This layer of unconformity was important to our research site and work.

Techniques and Tools

In the field, we learned how to identify fossil bones, special teeth, and volcanic ash. These items have different textures, patterns and sometimes different colors from rocks. Fossils are also very light. Teeth are very easy to identify because of their distinct color that distinguishes them from soil. Teeth were most of the specimen we found. Dr. Carranza also taught us the technique for digging out these specimens.

We learned when digging out specimen from the wall of the arroyos, we had to dig over the specimen and into the wall. Then we dug around the specimen so that it could be plastered. Dr. Carranza taught us how to create and apply plaster jackets (the same ones the doctors use for broken bones) on important species before transporting them to the lab for dating and identification. During the expedition, there were a total of five jackets made. Unfortunately, from our CityTech group we found little that was worthy of a plaster jacket. Some might think that it is mere luck whether or not a specimen is found, but I believe that experience is a big factor, since Adolpho and Christopher, the two research interns, found the most important specimens.

Field Lectures

From Dr. Carranza's lectures in the field, I learned that all of the animals found and studied were related to the horse, elephant, skunk, camel or rodent. Dr. Carranza explained to us how some physical characteristics change as species evolve e.g. the Dinohippus (taller than a zebra) evolving to the Astrohippus (the same height as a zebra), which evolved into a Nannippus (which is shorter than a zebra). These are all species of horses.

I learned that rodents are good time period markers. They die out with only a slight change in the eco-system. Volcanic ash and teeth are also very precise in determining time. The margin of error for dating these animals is about two thousand years. In order for soil to be dated, it must contain fossils or minerals. After collecting the fossil containing soil, paleontologists send it to a lab where it is dated by geologists date using potassium-argon dating.

WHAT WE FOUND

During the expedition, we went to a few different sites, e.g. Rancho El Ocote, Rinconada. From these different localities, we found the bones and teeth of many different animals. A large number of horse and camel's teeth were found; Renee contributed to five of them.

Kashif found about five pieces of turtle's shell. We also discovered a rhinosaurous' jaw bone with its teeth still intact. According to Dr Carranza, the last finding of this kind was four years ago. The biggest find, however, was made by Dr. Carranza himself -- a mammoth, a specie of elephant. The mammoth's fossils found were also a jaw bone with its teeth intact.

This was only the second time that Dr. Carranza made this discovery in his entire career. The first was in the 80's. After digging out the mammoth's bone, we found some horse ribs underneath. It was exciting to be present when he did this.

UPDATE FROM DR. CARRANZA

On completion of this part of the report, this report was sent to Dr. Carranza in Mexico to verify for clarity and accuracy. He read the report and include the following addendum:

According to Dr. Carranza, the jaw of the mammoth mentioned above is in excellent condition and has only one tooth belonging to a very old animal since the enamel in the occlusal surface was gone.

**THE FINAL PORTION OF THIS REPORT IS
EXCERPTS FROM KASHIF'S RESEARCH
JOURNAL DOCUMENTING AND RECORDING
DATY TO DAY RESEARCH ACTIVITY.**

A Journey To The Past With The Help of Earthwatch

Mexico is a paleontologist's paradise, crammed with a multitude of opposing identifies: desert landscapes, snow-capped volcanoes, ancient ruins, time-warped colonial towns, arroyos and hemphilian layers dating as far back as 4.8-9 million years. This mix of modern and traditional, clichéd and surreal, is Mexico's charm, whether your passion is throwing back margaritas, listening to howler monkeys, or scrambling over Mayan ruins. I was very excited and impressed with its beauty, charm and warmth. And even more eager and excited about the archaeological digging experience ahead for fossils in its ruins. I was so excited to be chosen for this expedition, for here was an opportunity for me to help write history digging up the past.

Saturday, June 28, 2008

The day had finally come after months of preparation. However, the morning of my flight I was very excited and eager that my mom and I made a couple of false starts, so we had to return home twice before we could actually head for the airport. Finally, with passport, tickets and money - and my adrenaline in check - we arrived at the airport, where I met fellow student travelers - Javier and Renee. I first met Renee and Javier at a BMI forum where its mission and programs offered to members were discussed. At this forum I met Mrs. Joan Schwartz who spoke about an interesting opportunity in which City Tech would send students on a research trip to Mexico - Earthwatch. Earthwatch bills itself as "the world's largest environmental volunteer nonprofit

organization,” and 38% of its participants are 50 or older. It does archaeological work as part of its focus on sustainable cultures.

We arrived five hours later in Mexico City, where we took a cab to the Holiday Inn Trade Center. Mexico City is the capital city of Mexico. It is very populous with over 8,000,000 inhabitants and the principal language is Spanish. Lucky for us Javier could speak Spanish, so we were able to communicate with the cab driver. We asked to be taken on a brief tour of the city. Our first mistaken as visitors because mayhem prevailed as vehicles jockey for the best position before becoming ensnarled in a tangled web of blocked intersections and jam-packed avenues. But amazingly, some parts of the apparently chaotic daily movement of tens of thousands of vehicles are very carefully choreographed by traffic signs and police with penetrating whistles: a single short whistle means "stop!"; while two short whistles means "Carry on!". A single long whistle, however, means "Everyone stop!" This entire experience I can best described as out-of-control anarchy. However, once we reached the hotel and settled in our rooms we soon decided it would be safer to take a walking tour. We were all so excited that the adrenaline kept us going. We found a nice Mexican restaurant about a mile from the hotel where we had steak, enchiladas, and a jalapeno salad which was delicious. The Mexican children who had never seen a black man were very friendly and eager to meet and greet me. A couple of kids came up to me asking me all kinds of questions making me feel like some sort of celebrity. So, I finished my first day in Mexico shaking hands while enjoying Mexican food and good hospitality.

Sunday, June 29, 2008

The following morning, we left Mexico City by bus for San Miguel de Allende. In all the excitement I left my wallet in the cab, which I happily later recovered. Four hours later we arrived at the Central de Autobus in San Miguel de Allende, where we caught a taxi to the Hotel Parador Del Cortijo. San Miguel de Allende one of Mexico's top tourist attractions with picturesque cobblestone streets and colonial architecture has nearly perfect weather year round, and it is very colorful and busy with tourist. In San Miguel we met Dr. Oscar Carranza and several other Earthwatch volunteers.

Dr. Carranza, Project Director, is a paleontologist. Paleontologists are scientists who study fossils of animals to learn about what the earth was like many years ago. They find these fossils by digging into layers of sedimentary rock. The paleontologist uses scientific methods to find out more about the animal that the fossil came from such as, how old a fossil is, and whether the fossil was formed on land or underwater. They use this and other information to learn more about the history of our earth. When they are looking for fossils they use picks, chisels, drills, shovels, and brushes. They use magnifying glass to get a closer look, and computers to analyze their finds.

At the hotel we were introduced to several other Earthwatch volunteers, majority of which were senior citizens except for Dr. Carranza's assistants - Christopher and Adolpho who attend Universidad de Mexico. As we talked the eldest in the group, Warren, amazed us all as he announced this would be his

52nd expedition with Earthwatch in addition to numerous other trips across the globe, which made him the most traveled individual I have ever met. Then, there was Charles - a sculptor who was also well-traveled focusing in North America because he loves to hike. Charles came along with his brother-in-law Richard, who is a retired physics professor from Princeton (where he graduated) and Washington State University. Richard is a well-known published physicist with a concentration in nuclear physics. There was also a dentist in the group from Seattle - Thomas. Then, I met George who works for Verizon and lives in Los Angeles. George was the reticent one who didn't talk much and mostly stayed to himself on the trip. Contrary to George, Chrissie a College literature professor, loved to be engaged in conversation either to tell a story or to give advice on traveling in Mexico, which she passionately loves. She shared with us that she loves the people, place and culture of Mexico and whenever she can she prefers to live with a native family during her visits. Last but not least, Ilene, a kindly woman probably an octogenarian around the age of my Grandmother, who worked as a nurse for the prison system. Like Warren, Ilene loved to travel. For her an ideal cruise is to get a ride on a freighter enjoying the company of the crew and captain. She believed - like many of the other volunteers including myself - that the only way to go and visit a country is to actually break away from the tourist attractions and see the people and how they live (their Culture and traditions in practice).

Shortly after we began sharing stories, Dr. Carranza returned and gave us an introductory lecture on the research he has been working on for more than 20

years. We walked around the grounds of the hotel for an hour or so while he continued to explain what we would be doing. Showing us bone fragments as well as telling us which parts of the animals are important and those we can discard. Dr. Carranza described for the team the most important to least important fossil: whole body, head, joints, teeth, ribs. Afterwards, we were all eager to get started, so we went to the first site - Rinconada. This locality was once the place where you could find the Rio Laja lake. Everyone was so eager to get started that all the volunteers started picking at the rocks hoping to find something. Richard found a few teeth as well as Dr. Carranza's wife. We then returned to the hotel - disappointed not to have found much, but excited about our first digging experience - to a delicious Mexican meal.

Monday, June 30, 2008

We started each day at 7am. First, we had breakfast. Then, before we left for the field, Dr. Carranza gave us a short lecture on where we were going and what we might find. Today, we traveled to a locality he called El Ocote. Located in Northwestern Chiapas, El Ocote's 300,000 acres are characterized by evergreen seasonal forest, lower montane rainforest, tropical deciduous forest, pine-oak forest and short-tree savanna. The reserve's forests catch rainfall which replenishes subterranean rivers that provide water for numerous communities, as well as for one of Mexico's most important hydroelectric dams.

At this site we were inside an arroyo digging in the Hemphillian layer. The Hemphillian layer dates from 4.8-9 million years ago. Enroute to this dig site, Dr. Carranza had warned that because the dirt in this area for some reason when

wet gets really sticky we must leave the area if it starts to rain immediately and follow him to the vans. Luckily when it did rain we all moved fast enough to keep up with him. He allowed us freedom to move about and dig, for as long as we desired because he said, "A happy volunteer makes for a better worker." When we went into the arroyo, Javier and I saw a huge bone laying on the surface of the dirt not fully dug out and decided to investigate. To our dismay, it was a hip bone therefore not important because it would give no information on the animal. Later, I found horse teeth, which are easy to identify because they are long and dark. Renee and Javier both also found teeth. At about 1 p.m. we sat down for lunch. Afterwards, everyone agreed to quit early.

Once we were back at the hotel everyone gathered in a circle around Warren to listen as he told us stories of his extensive travels around the globe, and how he loves meeting people of different cultures. He passed around a couple of album books, which chronicled all 51 Earthwatch expeditions he experienced. He showed an amazing amount of pride in his pictures that documented what he called, "his purpose." Then like every evening we sat down to another delicious traditional Mexican meal.

Tuesday, July 1. 2008

We started this morning the same as the others with breakfast and a brief discussion on paleontology. We then left for the arroyo in El Ocote. Everyone seemed to go back to the places where they were digging the day before. For the first half of the day we seem to just continue finding teeth. It was after lunch that we went back to the site and everyone other than Javier, Renee and I had a big

find. One of the main finds in the afternoon was a Rhino jaw which was discovered by one of Dr. Carranza's assistants. Now, all the focus was on excavating this jaw. First, we dug around the jaw to determine its size. We dug about half a foot away from where it showed in the dirt. After we dug around it to know how big it was we wet it, and then put napkins on it. This was to keep the plaster from sticking to the bone. We were able to find other small bones, but nothing of great significance. Once the Rhino jaw was prepared for us to carry it we left this site for the day and went to El Tongue another arroyo that Dr. Carranza said "He has been traveling to for over 20 years." He showed us around the arroyo and we went to one area where the side of the arroyo was falling and at the body he had a cast on a bone which he previously found, but was afraid to take out for fear that removing it would cause the rock to fall on someone. We then proceeded back to the hotel for food and rest.

Wednesday, July 2, 2008

Now, it was routine: we started each day at 7 am; and before we left for the field Dr. Carranza would talk to us about what we'd be doing. However, this morning he gave a more extensive lecture on glyptodonts as well as a brief geological discussion. Glyptodonts were large, more heavily-armored relative of extinct pampatheres and modern armadillos. They first evolved during the Miocene in South America, which remained their center of species diversity. He explained that glyptodonts could be found in the lower layers of the dirt. He showed us pictures of the glyptodonts with its shell which is a part of the glyptodont that he found a few years back with Warren's help. He also went over

faults which are breaks in the rocks that make up the Earth's crust, along which rocks on either side have moved past each other. He also talked about unconformities which are layers in the rock where no information can be gathered. We talked about the migration of animals from North America to South America and vice versa. His thinking was that there was competition for food in the North as well as the South, so there was an interchange. We spoke about the conflicts in research between the Texas finds and finds in Mexico. For example, he has found animals dating back 3.6 million years in Mexico as researchers in Texas have those same animals dating back 2.5 million years. According to Dr. Carranza, the big question for all paleontologists: "What was the path taken by the animals during the interchange?" I knew if I could find the fossil of a glytodonts it would be a great find for myself and school.

Once we were done with the discussion we headed for the next locality - En Gadazo. Here, we broke up into smaller groups because of the size of this arroyo and because everyone wanted to go in different directions. After walking around the arroyo searching for good areas to dig, I came across a fraction of what looked like a shell. Later I asked Dr. Carranza's his opinion and I could see he was excited to see it. He immediately identified it as a turtle shell.

Today, an interesting look into how things are discovered took place. Dr Carranza was called by one of the other volunteers to a place he found several bone fragments and as he was explaining what he found Dr. Carranza glanced across at the wall along the arroyo and sticking out was pieces of a mammoth jaw. He shouted "I have found my bone." He tagged the place on his GPS and

we left to get the proper equipment for tomorrow when we would be excavating the bone.

Thursday, July 3, 2008

Because Dr. Carranza was so excited about digging out the bone found on Wednesday, we didn't have a lecture this morning. Instead, right after breakfast we went immediately into the field. Once we reached back to the sight where he found the bone, we began excavation right away. We took the same measures by first digging around it as best as possible without digging underneath so as not to break the bone. Once we uncovered the full structure of the bone we then began wetting up all the bone showing so that when we covered it with plaster it would not stick.

Once we had it encased in what is called a jacket we tried to get it down from about 15 feet up along side the arroyo. We got it down, but as it was getting ready to rain and he knew we didn't have enough equipment to lift it out of the arroyo we had to leave it. So we got it to an area where it would be safe overnight from other people as well as the dirt sliding down the arroyo. On the ride back we stopped by an area where Dr. Carranza had once dug, a path which goes from the hemphilian layer dating 4.8-9 million years ago to the blancan dating 4.8 – 1.8 million years ago. This is one of the many things that make Mexico a paleontologist paradise.

Friday, July 4, 2008

After a short lecture, and the showing of slides of what the animals we dug up might look like, we discussed briefly the interchange before our last day of the

digging expedition. We also went over some ideas he had dealing with the interchange. One thought he felt he validated was that carnivores also took part in the interchange because he found skunk bones dating back 4.8 million years ago, which proved his theory about their movement from North to South. By the time he'd finished his final lecture he'd driven home one point that stood out from among the others: "the first step in evolution is geological change." This made us even more excited and proud because we'd taken part in finding fossil to confirm geological change.

We then went back to the arroyo where we left the jacket with the mammoth jaw inside. Now, it was time to get this jacket to the truck. It must have weighed about 200 – 250 pounds. It took seven people to carry it from inside the arroyo to the trucks about 100 yards away. When we finally put it on the truck you could hear a collective sigh of relief.

For myself I felt a bit of pride in knowing that I had taken part in this awesome find. Once we were done we went to another site - Arroyo Belen. This was an area where Dr. Carranza had never found much. We walked around the area for about an hour then we quit for lunch. Dr. Carranza along with his wife grilled some food for us that was nothing short of spectacular. They took us back to the hotel where we all talked for a long time about our thoughts on the whole experience.

Saturday, July 5, 2008

Javier, Renee and I spent the morning resting from all the digging. In the afternoon we went souvenir shopping and then reflected on our trip. We went

back to the hotel where we talked for a long time about our experience and how awesome it was to be part of this expedition and finding a mammoth jaw bone with its historical implications. For it was an experience never to be forgotten.